INCH-POUND

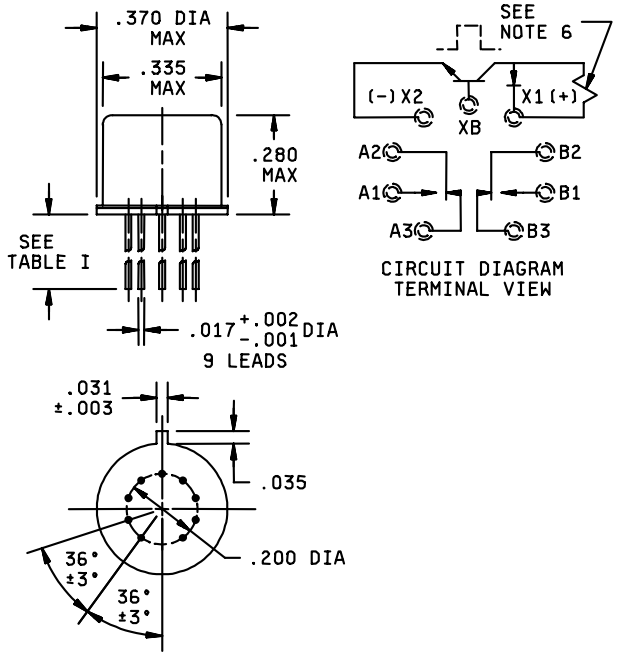
MIL-PRF-28776/1G
23 June 2003
SUPERSEDING
MIL-PRF-28776/1F
8 July 1996

PERFORMANCE SPECIFICATION SHEET

RELAYS, HYBRID, ESTABLISHED RELIABILITY, DPDT, LOW-LEVEL TO 1.0 AMPERE (TRANSISTOR DRIVEN) (ELECTROMECHANICAL OUTPUT)

This specification sheet is approved for use by all Departments and Agencies of the Department of Defense.

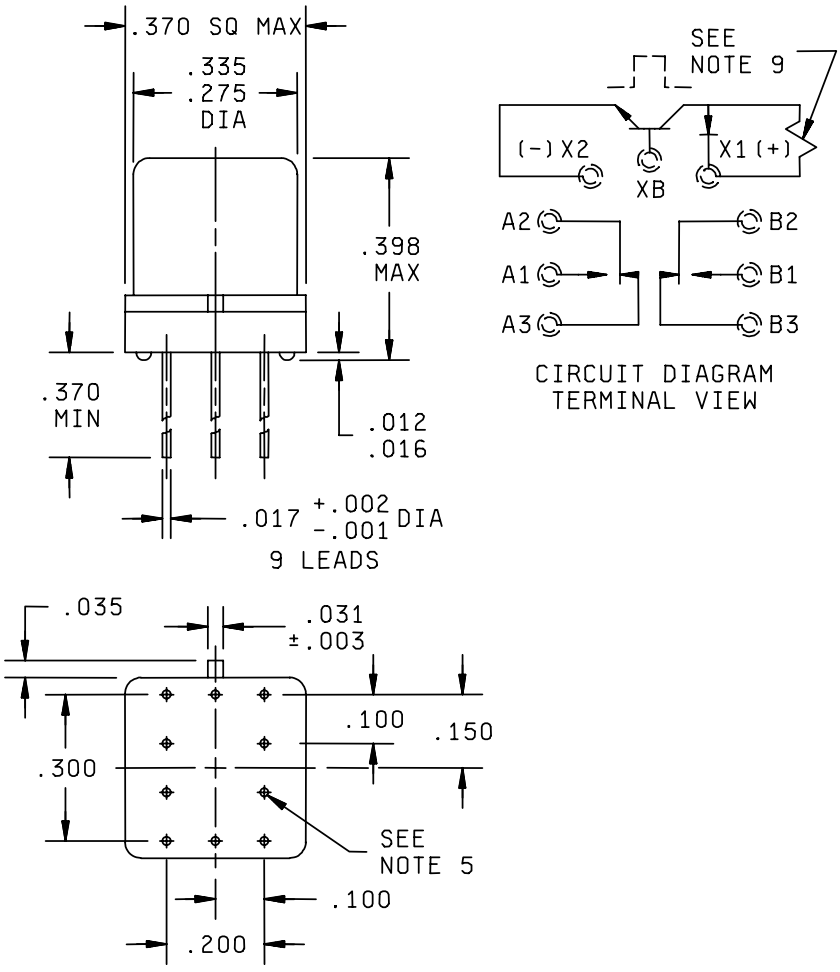
The complete requirements for acquiring the relays described herein shall consist of this specification sheet and the latest issue of MIL-PRF-28776.



Inches	mm
.001	0.03
.002	0.05
.003	0.08
.017	0.43
.031	0.79
.035	0.89
.200	5.08
.280	7.11
.335	8.51
.370	9.40

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
4. Terminal numbers shown above are for reference only. Numbers do not appear on the relay.
5. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
6. Coil symbol optional in accordance with MIL-STD-1285.
7. Circuit diagram shown on part is the terminal view.

FIGURE 1. Dimensions and configuration.



Inches	mm
.001	0.03
.002	0.05
.003	0.08
.012	0.30
.016	0.41
.017	0.43
.031	0.79
.035	0.89
.100	2.54
.150	3.81
.200	5.08
.275	6.98
.300	7.62
.335	8.51
.370	9.40
.398	10.11

NOTES:
1. Dimensions are in inches.
2. Metric equivalents are given for general information only.
3. Unless otherwise specified, tolerance is ±.010 (0.25 mm).
4. Spreader pads shall comply with the requirements of A-A-55485/05-003.
5. Dimensions and tolerances shown for the bottom view of the spreader pad are for the center to center locations of the holes in the spreader pad.
6. Shape optional within the envelope dimension.
7. Terminal numbers shown above are for reference only. Numbers do not appear on the relay.
8. Relays shall have a plus (+) sign placed on the circuit diagram as shown.
9. Coil symbol optional in accordance with MIL-STD-1285.
10. Circuit diagram shown on part is the terminal view.

FIGURE 2. Dimensions and configuration relay with spreader pad attached.

REQUIREMENTS:

CONTACT DATA:

Load ratings:

High level (relay case grounded):

Resistive:
1.0 ampere at 28 V dc.
250 milliamperes at 115 V ac 60 and 400 Hz case not grounded.
100 milliamperes at 115 V ac 60 and 400 Hz case grounded.

Inductive: 0.2 ampere at 28 V dc with 0.32 henry inductance.

Lamp: 0.10 ampere at 28 V dc.

Low level: 10 μA to 50 μA at 10 mV to 50 mV dc or peak ac maximum.

Intermediate current: Applicable.

Contact resistance or voltage drop:

Initial: 100 mΩ maximum, 125 mΩ maximum with spreader pad attached, (tested at 10 mA maximum at 6 V dc maximum or peak ac).

High level:

During life: Not more than 5 percent of open circuit voltage.

After life: 200 mΩ maximum (225 mΩ maximum with spreader pad attached).

Low level:

During life: 33 Ω maximum.

After life: 150 mΩ maximum (175 mΩ maximum with spreader pad attached).

Intermediate current:

During life: 1 Ω maximum.

After life: 200 mΩ maximum (225 mΩ maximum with spreader pad attached).

Contact bounce: 1.5 ms maximum.

Contact stabilization time: 2.0 ms maximum.

Overload (high level only): Two times rated current. Not applicable to ac load ratings.

COIL DATA:

Supply voltage: See table I.

Turn-off time: 7.5 ms maximum.

Turn-on time: 2.0 ms maximum.

DIODE DATA:

Coil transient suppression: 1.0 V maximum.

Diode peak inverse voltage: 100 V minimum.

TRANSISTOR DATA:

Specified base turn-off voltage: 0.3 V dc maximum.

Specified base turn-on current: See table I.

Base emitter current: 15 mA maximum.

ELECTRICAL DATA:

Insulation resistance: 10,000 MΩ minimum at 500 V dc, except the resistance between coil and case at high temperature shall be 1,000 MΩ minimum.

Dielectric withstanding voltage:

	Sea level V rms (60 Hz)	Post intermediate current life test Sea level V rms (60 Hz)	Altitude V rms (60 Hz)
Between case, frame or enclosure, and all contacts in the energized and deenergized positions:	500	500	
Between case, frame or enclosure, and coil:	500	500	125
Between all contacts and coil:	500	500	All terminals to case
Between open contacts in the energized and deenergized positions:	500	375	
Between contact poles in the energized and deenergized positions:	500	500	

ENVIRONMENTAL DATA:

Temperature range: -65°C to +125°C.

Shock (specified pulse): Applicable. Test condition B.

Magnetic interference: Applicable.

Salt atmosphere (corrosion): Applicable.

PHYSICAL DATA:

Terminal strength: Applicable.

Pull test: Test condition A, 1 pound pull.

Bend test: Test condition C, 0.5 pound pull.

Twist test: Applicable.

Dimensions and configuration: See figures 1 and 2.

Weight: 2.55 grams (0.09 ounce) maximum, 2.80 grams (0.099 ounce) maximum with spreader pad attached.

Seal: Hermetic.

Minimum marking: As specified in MIL-PRF-28776.

LIFE TEST REQUIREMENTS:

High level: 100,000 cycles.

Low level: 100,000 cycles.

Intermediate current: 50,000 cycles.

Mechanical life: 1,000,000 cycles.

Part or Identifying Number (PIN): M28776/1- (dash number from table I and suffix letter designating failure rate level).

TABLE I. Dash numbers and characteristics. 1/

Dash numbers 2/				Supply voltage (V dc) 5/		At +25°C						Over temperature range			
Lead length 1.500 min 3/	Lead length .187 +.050 -.010	Lead length .500 min	Spreader pad (fig. 2) 4/	Rated	Max	Coil resistance (ref. only) ohms 6/	Coil circuit current (mA) 6/ 7/ Max	Coil circuit current (mA) 6/ 7/ Min	Specified pick-up volt. (V dc) 7/	Specified hold volt. (V dc) 7/	Specified drop-out volt. (V dc) 7/	Specified base current to assure turnon (mA)	Specified pickup volt. (V dc) 7/	Specified hold volt. (V dc) 7/	Specified drop-out volt. (V dc) 7/	Specified base current to assure turnon (mA)
013	019	025	031	5.0	5.8	50	112.1	82.2	2.7	1.4	0.22	.75	3.5	2.3	0.14	3.00
014	020	026	032	6.0	8.0	98	69.9	52.9	3.5	2.0	0.28	.55	4.5	3.2	0.18	2.04
015	021	027	033	9.0	12.0	220	47.4	35.3	5.3	3.0	0.54	.36	6.8	4.9	0.35	1.36
016	022	028	034	12.0	16.0	390	35.8	26.6	7.0	4.0	0.63	.27	9.0	6.5	0.41	1.03
017	023	029	035	18.0	24.0	880	24.0	17.9	10.5	6.0	0.91	.16	13.5	10.0	0.59	0.68
018	024	030	036	26.5	32.0	1,560	19.8	14.7	14.2	8.0	1.37	.13	18.0	13.0	0.89	0.50

1/ Each relay possesses high level and low level capabilities. However, relays previously tested or used above 10 mA resistive at 6 V dc maximum or peak ac open circuit are not recommended for subsequent use in low level applications.

2/ The suffix letter L, M, P, or R to designate the applicable failure rate level shall be added to the applicable listed dash number. Failure rate level (percent per 10,000 cycles): L, 3.0; M, 1.0; P, 0.1; R, 0.01. Example: 013L - - - - - -024R.

3/ 1.500 leads are inactive for new design.

4/ Relays supplied with spreader pads (-031 through -036) shall have the pad rigidly attached.

5/ CAUTION: The use of any supply voltage less than the rated supply voltage will compromise the operation of the relay.

6/ Coil resistance not directly measurable at relay terminals. When rated supply voltage is applied to the supply terminals, the coil circuit current must be within the limits shown. Measure at 25°C at rated supply voltage for 5 seconds, maximum.

7/ Set base current from 3 mA to 15 mA during electrical measurements.

QUALIFICATION INSPECTION:

Qualification inspection and sample size: See table II.

TABLE II. Qualification inspection and sample size. 1/

Single submission	Group submission	
37 units plus 1 unsealed unit for level L at C = 1 2/	M28776/1-030	37 units plus 1 unsealed unit for level L at C = 1 2/
63 units plus 1 unsealed unit for level M at C = 1 2/		63 units plus 1 unsealed unit for level M at C = 1 2/
Qualification inspection as applicable.		Qualification inspection as applicable.
	M28776/1-025	2 units each PIN
	M28776/1-026	Qualification inspection group I.
	M28776/1-027	
	M28776/1-028	
	M28776/1-029	

1/ For retention of qualification or extension of qualification to lower failure rate levels, all life test data accumulated on MIL-PRF-28776/3, MIL-PRF-28776/4, and MIL-PRF-28776/5 may be used in addition to MIL-PRF-28776/1 data.

2/ The number of units required for qualification testing shall be increased as required in group Q5 of table II, MIL-PRF-28776, if the relay manufacturer elects to test the number of units permitting two or more failures. Prior to performance of qualification inspection testing, the relay manufacturer shall preselect the sampling plan.

Qualification inspection testing for relays supplied with spreader pads (-031 through -036), two (2) units of the 26.5 volt rated coil voltage (-036) shall be tested as follows:

Perform A1 tests of group A inspection. Relay leads shall be formed and the mounting pad removed.

Perform seal test. Rigidly attach mounting pad to relay. Perform A2 and A3 tests of group A inspection.

Perform visual and mechanical inspection (external).

Group A inspection testing for relays supplied with spreader pads (-031 through -036) shall be tested as follows:

Perform A1 tests of group A inspection. Relay leads shall be formed and the mounting pad removed.

Perform seal test. Rigidly attach mounting pad to relay. Perform A2 and A3 tests of group A inspection.

Perform visual and mechanical inspection (external).

Qualification inspection (reduced testing) and sample size: See table III. If the relays produced for MIL-PRF-28776/1 are similar in construction and design except for the coils to the relays produced for MIL-PRF-28776/3, then reduced testing for qualification of MIL-PRF-28776/1 relays may be performed concurrent with or subsequent to successful qualification of MIL-PRF-28776/3 relays.

TABLE III. Qualification inspection (reduced testing).

Examination or test
2 units each supply voltage: Group Q1 of qualification inspection table. 1 unsealed sample unit: Internal examination.

SUPERSESSION DATA:

Supersession data: See table IV.

TABLE IV. Supersession data.

Superseded PIN M28776/1-	New PIN M28776/1-
001	013
002	014
003	015
004	016
005	017
006	018
007	019
008	020
009	021
010	022
011	023
012	024

1/ Dash numbers -013 through -018 are inactive for new design and are for support of existing equipment designs only.

Custodians:
Army - CR
Navy - EC
Air Force - 11
DLA - CC

Review activities:
Army - AR, CR4, MI
Navy - AS, OS, SH
Air Force - 19, 99
NSA - NS

Preparing activity:
DLA - CC

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